Specifications for LN2 Storage System

The Naval Center for Space Technology (NCST) at the Naval Research Laboratory (NRL) maintains a 26,000 gallon Liquid Nitrogen (LN2) storage and distribution facility to supply the environmental testing facility located in building A-59 on the Laboratory. The NRL has a requirement for the removal and replacement of the existing system with a new system that satisfies the requirements set forth herein. Please note that the Contractor must, not only deliver the system, but also install and "check-out" the new system once installed to ensure that the system is properly operating.

1.0 General Requirements:

- The overall system must have a net storage capacity of the system of 26,000 gallons of LN2 and a flow capacity of a minimum of 4400 gallons per hour at 85 psig continuously. This flow rate must be sustainable for a minimum of 4 hours. The system must be capable of supporting both Acoustic Chamber and Big Blue chamber operations at maximum LN2 draw rates simultaneously.
- The successful offeror and all subcontractors must comply with all NRL safety office regulations while working at NRL, as set forth in the Requirements for On-site Contractors, which will be attached to the resulting contract and can be found at http://heron.nrl.navy.mil/contracts/home.htm for review.
- The Contractor must provide an Operator's Manual (5 copies) for the system in accordance with Exhibit A, Contracts Data Requirements List (DD Form 1423). The manual must include all vendor information for each individual component used in the manufacture of the system, as well as any and all revised "AS-INSTALLED" drawing.
- The Contractor must provide three (3) days of all necessary training for the operation of the system.

2.0 Old System Removal:

- The Contractor must remove the existing 11ft x 60 ft horizontal tank from the facility. As previously stated, all OSHA and NRL Safety Office requirements must be met during removal of tank. As part of this removal, the Contractor must be responsible for the safe disposal of all existing system components. NRL has the option of saving any existing components as the demolition occurs, and will notify the contractor of any such requests. The Contractor must disconnect the existing vaporizer, however the vaporizer will remain the property of NRL and NRL will be responsible for removing it from the work site.
- The Contractor must begin demolition of the existing system no earlier than 45 days prior to the delivery of the new LN2 tanks. All target dates must be agreed

to and coordinated with NRL in order to maintain functionality of the facility as long as possible.

3.0 Site Preparation:

- The Contractor must remove the existing foundation and construct the new foundation.
- The Contractor must submit the final site plan at least 60 days prior to the start of construction. Within fifteen (15) days of receipt, the Government's technical representative will return comments. The Contractor must, within fifteen days of receipt of the Government's comments make necessary adjustments or resolutions. The Government must approve final plans prior to start of construction.

4.0 Storage Tanks:

- The supplied LN2 storage tanks must be two (2) equally sized vertical tanks, with a minimum net combined storage capacity of 26,000 gallons of LN2.
- The tanks must be insulated using XCEL® composite insulation or equivalent, which must be approved by the NRL prior to use. The Normal Evaporation Rate (NER) must be a maximum of .10% oxygen/day.
- The rated operating pressure of the Tanks must be 250 psig.
- The Contractor must design each tank in accordance with ASME pressure vessel code.
- The Contractor must provide pressure relief devices in accordance with CGA S-1.3 latest version, and this specification.
- The liquid withdrawal on each tank must be a 2-inch diameter vacuum jacketed withdrawal.
- Tank pressure must be maintained at 85 psig+/-5 psig under all operating conditions and flow rates.
- Each tank must include a mechanical level gauge and a mechanical pressure gauge.
- Each tank at delivery must have a shell vacuum no greater than 10 milliTorr and the measured vacuum must not change during tank installation.

5.0 Pressure Relief:

- The tank system must contain two sets of pressure reliefs and burst discs separated from each other by hand valves, which allows servicing of one set of reliefs while the other set is in service. Each set of relief devices must service

both tanks while in service or each tank must have redundant switchable relief devices.

- An active adjustable pressure relief system must also be provided to control pressure at a much lower (near the tank operating set point of 85 psig) set point. This relief pressure set point must be adjustable by the operator. This system must also allow for remote pressure relief by an operator controlled switch. (This pressure relief is the primary backup, and in addition to the tank pressure control loop.)

6.0 Liquid Feed Lines:

- All liquid lines and valves from the storage tank to the point where they enter the building must be vacuum jacketed. All connections must be vacuum jacketed, as well. At the point of entry into the building, the new piping must be connected to the existing facility piping by the contractor. NRL will specify the entry points for each line into the building. Each feed line must be a minimum of 2 inches ID vacuum jacketed line from the tank to the building entry point.
- Each liquid feed line entering the building must incorporate an actuator controlled in-line valve which can be remotely operated by an electrical signal. These valves must provide an electrical indication of true position (open/closed).
- Each liquid feed line must include two (2) ½ inch FPT taps for installation of transducers by NRL.

7.0 Gaseous Nitrogen System:

- The system must have two (2) 15,000 SCFH vaporizers, which must be connected to the LN2 tanks using Python ® jacketed piping or NRL approved equivalent.
- The GN2 system must have an automatic switch, which switches vaporizers automatically to prevent vaporizer icing. The option must be available to operate both vaporizers simultaneously for short periods of time.
- All piping after the vaporizers must be 2 inch diameter schedule L hard copper and must be joined by brazing or using high temperature silver solder. It must be connected to the existing piping by the Contractor at the point of entry into the building. The Government will specify the point of entry.
- The outlet of the vaporizers must include an automatic temperature control device to prevent overdrawing on the vaporizers.
- The GN2 feed line must include a remotely controlled shut-off valve and two (2) ½ inch FPT taps for installation of transducers by the NRL.

8.0 Remote Controls and Indications: The storage system must include the following controls and transducers with remote (inside) indication.

- Tank pressure and level for each tank.
- LN2 feed valve control (2 controls) with true valve position indication.
- GN2 feed valve control.
- Vaporizers switching unit control with indicator.
- Tank pressure relief control.
- A graphical system layout diagram for the control panel. (Hard copy and computer file).
- Any conduit and wiring required between the control panel and the storage system will be the responsibility of the Government. The contractor shall supply the Government with the electrical requirements 30 days prior to the start of construction. The contractor shall also perform final connections of the controls.

9.0 Contract Deliverables Requirements list: The Contractor shall provide the following in accordance with Exhibit A, Contract Data Requirements List (DD Form 1423):

- System layout and design drawings, including wiring diagrams and electrical requirements, updated to AS-INSTALLED configuration (5 copies).
- Operators manuals including component manufacturers manuals. (5 copies)
- Site plan, including foundation plan. Required 60 days prior to start of construction. Must be approved by the NRL prior to start of construction.

10.0 Options:

- OPTION ONE: The Contractor shall provide a LN2 tank storage with a minimum net capacity of 20,000 gallons.
- OPTION TWO: The contractor shall provide for the complete electrical installation.
- OPTION THREE: The contractor shall provide a single LN2 tank, mounted either horizontally or vertically, with a minimum net storage capacity of 26,000 gallons.